Bleeding Canker Disease of Silver Maples

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History and Background

A disease very similar to sudden oak death was first noticed in the Northern Nevada by Leslie Lyles in 1999 when she was called to help a troubled maple tree by a homeowner. Since then, she has kept records of all reported new cases of this disease. By 2002, there are more than 20 mature silver maple trees reported, most of them have been dead and removed afterwards without formal investigation. It is believed that more cases have remained unreported. In 2002, a preliminary investigation was conducted under the collaboration between the Nevada Department of Agriculture and the University of Nevada Cooperative Extension. This disease was diagnosed as a bleeding canker disease of silver maple caused by *Phytophthora cactorum*.

Symptoms

The typical symptom of SMBC is dark brown bleeding at the lower trunk of silver maple trees (Fig.1 left). Canker can be found up to 8 feet above the soil line. Permanent dark staining can be seen when the bleeding sap dries up. When outer bark tissue is removed, clear lesions can be seen in the inner bark tissue (Fig. 1 middle.). In an old canker area, bark tissue may decay due to the colonization of other microorganisms. Bark crack is common in the affected area. Canker can girdle the trunk (Fig. 1 righgt) and finally kill the tree.

Etiology

Phytophthora is a genus of Oomycetes. Many species of this genus cause serious diseases in agricultural and horticultural plants. They can attack leaves, fruits, stems, and roots. For example, *Phytophthora infestans,* a historical pathogen, caused Irish famine in 1845 and 1846 due to potato late blight disease, which resulted in the death of hundreds of thousands of people and the emigration of more than 1.5 million people to the United States.

Unlike other canker diseases, *Phytophthora* bleeding canker is very progressive. Predisposition of trees by other factors may not be necessary for its infection. Also, when a tree is infected by this fungus, no visible fungal fruiting body or structure can be seen with naked eyes, which makes diagnosis difficult. *Phytophthora* can be soil-borne, water borne or even air borne, depending on the hosts and the type of diseases.

Fig.1. Dark brown bleeding on the trunk surface of a silver maple tree (left), lesions inside the bark tissue of a canker area showing margins between healthy tissue and the lesions (middle), and girdling canker on the base of trunk of a silver maple tree.

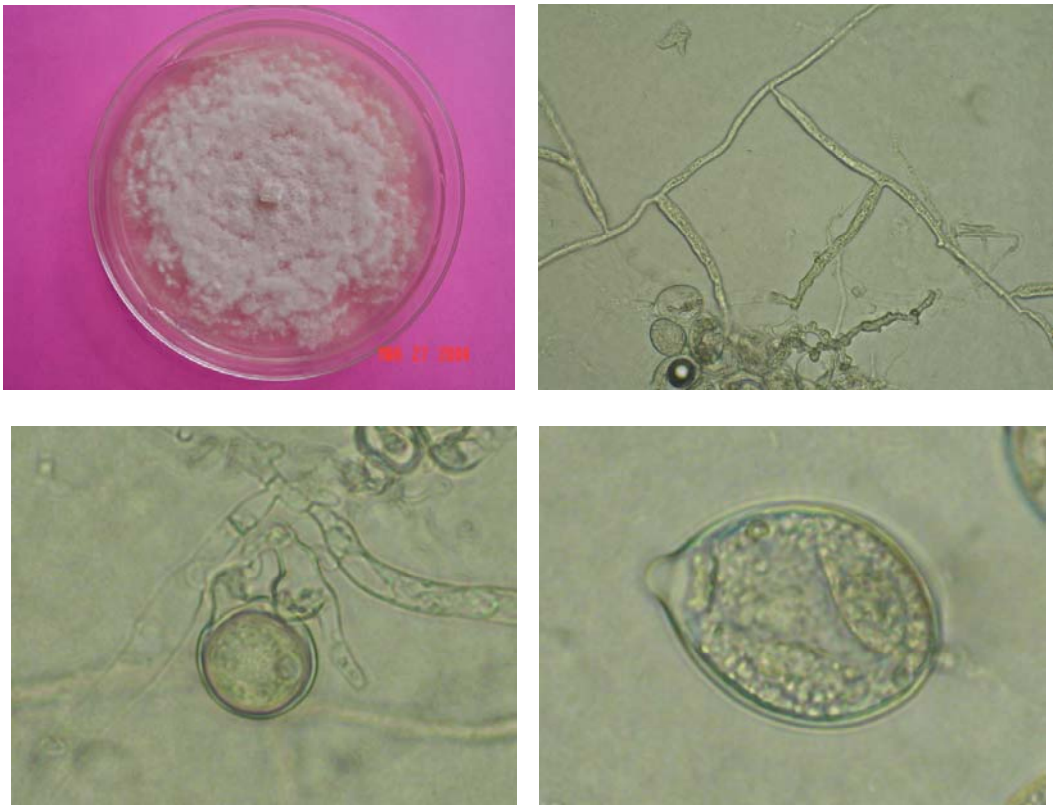

Fig.2. Characteristics of the pathogen *Phytophthora cactorum* isolated from infected trees. Upper row: growth pattern on a potato dextrose agar medium (left) and coenocytic (nonseptate) mycelium (right); lower row: oospores in oogonia with paragynous antheridia (left) and papillate sporangia with short pedicels (right).

Phytophthora cactorum is a species that causes bleeding cankers of maples and can parasitize more than 200 plant species in 150 genera of 60 plant families (Tucker, 1933; Nienhaus, 1960). In a Petri dish, a purified growing colony of a *P. cactorum* is generally white to gray (Fig. 2, upper left), depending on the type of growth media. The hyphae do not have any septa, which means that the mycelium grows as a matrix without cross walls (Fig. 2, upper right). Under proper nutrient conditions, the fungus produces sporangia (Fig.2, lower right), each of them contains lots of spores called zoospores. Released zoospores have two flagella and can swim in water for hours, and then develop a cell wall within minutes to form a cyst which is called encysted zoospores. Encysted zoospores germinate and infect plants.

Generally, *Phytophthora* can survive in the infected bark or tree in the form of mycelium. During the growing season, it can be transmitted by rain because spores especially like water and high humidity. If the fungal spores contaminate the water, the fungus can go wherever the water goes. Pruning can transmit the disease if tools are not sterilized after each pruning.

Detection and Management

The detection of silver maple bleeding canker disease is based on the observation of symptoms and identification of the fungus. Any dieback, discoloration on trunks, dead bark tissue, sunken or raised surfaces, cracks or bleeding could suggest the presence of this disease. The presence of dark brown bleeding fluid is one of the most diagnostic characteristics of silver maple bleeding canker disease. A hatchet can be used to scrape off outer bark tissue to reveal clear margins of lesions inside the bark. The tissue around the margin area is valuable for the further detection of *Phytophthora* or other fungi in a plant pathology laboratory. Complete diagnosis can be done by a plant pathologist.

Management of silver maple canker disease should be based on the integrated pest management (IPM) principle. Keeping growth vigor is very critical to avoid any attack from *Phytophthora.* Although *Phytophthora* can attack trees without any predisposition, a healthy tree is generally more resistant than a stressed tree. Avoid wounding or severe pruning. Remove cankers and treat with a disinfectant immediately to prevent further expansion of a canker area. Remove and burn all cankered tissue.